

This letter has already run to great length, but in conclusion I should like to add a few words anent the wooden ornaments already referred to. They are usually turned in a lathe, and in shape are not unlike the ninepins of our childhood, but the knob at the top is originally larger in proportion, and continued upwards into a tenon; the knob is then carved away so as to leave two interlocking loops, and the tenon is fitted into the weather board. At the corners of the roof there are often pendent disks of wood fringed with these ninepins, so as to form a sort of wooden tassel. These would answer well for a rude copy of bells which similarly fringe the roofs of the Chinese pagodas, and it is possible that there is a direct connection between the two, but in any case their association with a concave roof is at least a remarkable coincidence.

B. D. OLDHAM

Camp Matil in the Himalayas, April 9

The Recent Earthquake

SINCE the earthquake of Lisbon in 1755 troubled the waters of the fish-pond, called Peerless Pool, in the London City Road, it has been a well-known fact that earth-waves had a direct influence in producing an alteration in the level of waters inland, as well as in producing tidal waves sweeping the coasts. The earthquake of Tuesday, April 22, has produced a marked, and, so far, permanent, change in the level of underground waters in the district most affected by the shock, but how far this influence extended there is not yet evidence to show, for, judging by past experience, it may probably prove that springs have increased in volume and the underground water-levels have been raised over the whole area affected by the recent shock, which includes the district lying between Broadstairs and Bristol, 165 miles from east to west, and from Spilsby to Ryde, 170 miles from north to south, and possibly beyond it. It will be of especial interest to know whether the Wealden area, which, as Mr. Topley has pointed out, was free from the more direct influence of the shock, experienced any rise in its underground waters.

At Colchester the water supply is derived from a deep artesian well in the chalk, the supply from which has slightly lessened during the past few weeks, necessitating the lengthening of the suction pipes; and the necessity of still further lengthening them was under discussion, when the Water Committee were agreeably surprised to find that the earth-wave of the 22nd had caused an increased flow of water, and a rise in the water-level of 7 feet, which has so far been maintained.

Earthquakes were described by Mallet "as the transit of a wave of elastic compression." This motion at Langenhoe produced fissures in the gravel walks of the vicar's garden, and at West Mersea opened a fissure a rod in length, which for a short time took off the springs which supply the village with very pure water, and when, after an interval, the pools in which the water accumulates were again full, it was found to be red and thick, and in some of them to be strongly mixed with chalk.

At Bocking the height of the water in Messrs. Courtauld and Co.'s well has been taken weekly for some years; the surface of the well is 137.07 feet above the mean sea-level, and the heights given represent the number of inches the water rises above the surface; the results are very remarkable, the highest previous reading being on Easter Monday, 1883, when it was 19 inches.

The following is the weekly record of the level of water in Messrs. S. Courtauld and Co.'s well, Bocking, Braintree, Essex. The observations are made at 6 a.m. on Monday mornings; no water is drawn from the well on Sunday.

1884	Inches	Corresponding period 1883	Inches
March 31	14½	April 2	13
April 7	15	" 9	12
" 14	12½	" 16	13½
" 21	12	" 23	14½
" 28	31½	" 30	16
" 29	32½	—	—
" 30	34	—	—
May 1	34	—	—
" 2	36	—	—
" 3	38½	—	—
" 5	42	May 6	15

The readings being weekly, and the earth-wave occurring the day after the record was taken, unfortunately a week elapsed before the remarkable rise was ascertained; after that the readings were taken daily, showing a continued steady rise in level.

These facts tend to show that the recent earth-wave has caused the fissures to open, and to permit a freer circulation of water, and that consequently the "cone of exhaustion" has been filled up with water; and that the only example of this effect so far received should be from chalky districts is not surprising when it is remembered, as Prof. Ansted pointed out, that, though the chalk absorbs water freely, it parts with it slowly, the water derived from chalk-wells being due more to water travelling in the joints and fissures than to the water stored in the chalk itself. It would appear probable that when the increased volume of water now running off, through the enlarging of the sectional area of the fissures, is again lowered by pumping, the old artesian gradients will be resumed, and that the present increase will be only temporary.

As Secretary of the Underground Water Committee of the British Association, I shall be glad to receive any further information on these phenomena.

C. E. DE RANCE

Museum, Jermyn Street, S.W.

FROM recent observations I have concluded that the seismic vertical was at or near Dr. Green's house, close to the Strood or Causeway which connects the mainland of Essex with Mersea Island. The house was built in 1860, and is therefore new. I may here observe that (as I hinted before in former letters) the modern, cheaply-built cottages were not so much affected as the more ancient ones. The chimneys, walls, &c., of the latter were invariably destroyed, damaged, or cracked—the former seldom so. I was much surprised at this. The first thought naturally was that these "jerry-built" houses would be shaken down like a pack of cards. Is it that their very looseness of structure is in their favour, as compared with the stronger-built cottages of two and three hundred years ago? I have somewhere seen that in earthquake-visited centres the houses most secured from destruction are the loosely-built, low edifices. One can speak plainly on this matter, as no premium is required to encourage the development of "jerry-building."

Dr. Green's house is literally split and cracked in all directions, and the splits and cracks are the most vertical of any to be seen. The entire building was twisted on its foundations. At the south-west corner this is visible to the amount of about one inch and a half. Dr. Green informed me he was lifted up, as if from behind, and shot violently forward.

A friend of mine remarks (and I noticed the same fact in my note-book, but omitted inclosing it in my last communication) that the railway cutting at Wivenhoe appears to have broken the continuity of the undulations, for the houses contiguous to it are comparatively uninjured.

A noteworthy fact in connection with the recent earthquake, to which I can personally testify, and which appears to be the general experience of all the most trustworthy observers I have come across, is that the sounds or noises preceded the oscillations for an appreciable period of time. Mallet's experiments showed that the shock of an explosion travelled through wet sand at the rate of 951 feet per second. In Ipswich we are situated chiefly on drift sands and London Clay, and allowing that the earthquake shocks travelled through these strata at a more rapid rate, it is not likely to have been much more rapid. As sound travels at the rate of 1118 feet per second, it is very probable that the noise accompanying the earth-movements preceded the oscillations.

Mr. Wilkins, the well-known yacht-builder at Wivenhoe, tells me he was standing at the time the earthquake occurred in the yard, and his first impression was that a new yacht he was looking at was heeling over, and he called out so to his workmen in the shop close by. Then followed the crash of the tall chimney and the rending of the walls. The workshop has an upper floor, with windows on each side, and, as he stood in the yard, Mr. Wilkins says the oscillatory waves were such that he was enabled to look right through these windows, so as to see the falling chimneys of the buildings on the other side. He calculates that there must have been a rise and fall of the ground of 2 feet 9 inches to have enabled him to do this.

On Saturday, May 3, the members of the Ipswich Scientific Society made an excursion to Langenhoe and Peldon, and Mr. Henry Miller, C.E., the honorary secretary, kindly took the following exact measurements of the rents seen in a building adjoining Peldon Mill. There are two of them, succeeding each other at a short distance, and they pass through the brickwork at an angle of just 30°. At the gable end of this building there is

another rent in an opposite direction at an angle of exactly 32° . The brick shaft of the mill stands by itself, and is about 40 feet high. The upper part, ten feet from the top, is broken right through, evidently by the swaying motion, and is twisted round on the lower part one inch and a half towards the south-east. The size of the chimney at this part is 3 feet 9 inches square.

In view of Mr. Topley's suggestion that the earthquake may have some connection with the underlying ridge of Palæozoic rocks, it would be interesting to know if any shocks were felt in the Boulonnais and the Ardennes.

J. E. TAYLOR
Ipswich Museum

At the Cross Farm, East Mersea, on April 25, I was shown in the garden two places where water, it was said, spouted up shortly after the shock on the 22nd. They were about ten yards apart on a freshly dug piece of ground on a slight slope, and the woman who lived in the house close by informed me that after the shock she had observed water spouting out from them, and that it continued to do so until after her dinner, which was at one o'clock, when it ceased. There was enough water she said to cause a small stream to run down from each place towards her house, where they formed a puddle; her husband tasted the water and told her it was brackish. There was still evidence of the truth of this statement: the earth at each spot was damp, as was also a small channel which the water had made running down the slope. It appeared as if a small underground water-pipe had burst and the water had been forced above the surface. Cross Farm, I believe, is about a quarter of a mile from the sea, and perhaps twenty feet above its level.

EDWARD NEWTON
Lowestoft, May 5

THIS village lies partly on the lowest beds of the Chalk, and partly on the Gault; it is between N. lat. $51^\circ 49'$ and $51^\circ 50'$, and W. long. $0^\circ 40'$ and $0^\circ 41'$. The shock was felt at the church, and at two cottages where are invalids in bed. The church is on rising ground at the edge of the chalk platform which lies below the Chilterns, some two miles away from them. I was on the scaffolding erected for repairs to the church. At a little past nine—it could hardly have been later, I think, than 9.15, if so late—I felt the church give what seemed like a fierce shudder. This seemed to begin on the east, rather to north, and travelled westwards nearly. By shudder I mean that a sort of vibration began, which almost instantly increased in intensity, reached a climax, and then rapidly decreased and died away. It seemed to me to begin slightly north of east, because I remember feeling (for what reason I can hardly say) that the cause was hidden from me behind the east end of the church. I was on the south side, some eighteen feet from the south-east corner. A moment after a whirlwind followed, which began, as I find, near the top of the slope north-east of the church, and followed the churchyard wall which bends round the churchyard to south-west. In a cottage on the junction of the Chalk and Gault (or very near the junction), according to the result of inquiries I have made of an invalid there, the pictures on a wall lying north-west and south-east waved from and to the wall, but seemed also to move along it somewhat, i.e. north-west and south-east. Flower-pots on a table rocked in a direction almost east and west, and a window facing the south-east shook; her bed also, lying north-west and south-east, waved, and seemed as if giving way. This took place, she says, a little after nine. In a cottage on the Gault where another invalid was lying, a window facing south-west rattled, a picture shook on the wall on which it is fixed, and the bed, lying south-east and north-west, also waved. This was, she thought, at nine, but the time must have been later. She noticed that the wind was still. No noise was heard except the clatter caused by the rattling of the buildings; but at a mill on the Icknield Way, near Tring, lying at nearly lat. $51^\circ 48'$, and long. $0^\circ 40'$, a rumbling was heard.

FREDERICK W. RAGG
Masworth Vicarage, Tring, May 6

Black Rain

THE following paragraph from the *Field* of May 3 will probably interest those of your readers who have seen my note in the last number of NATURE (p. 6):—

“Black Rain.—Yesterday afternoon (April 28) a violent thunderstorm raged over the district between Church Stretton and Much Wenlock. Torrents of rain fell, seemingly a mixture

of ink and water in equal proportions. One old man here says he never saw anything like it but once. I certainly never saw such a coloured rain, and I intend to have a bottle of it analysed. Even this afternoon the little brooks are quite black, and the ruts in the roads look as if ink and water had been poured into them.—Rev. R. I. BUDDICOMBE, Ticklerton, Church Stretton.”

An analysis of the rain which fell at Stonyhurst showed that the impurity was almost entirely carbon.

S. J. PERRY
Stonyhurst Observatory, Whalley, May 4

The Remarkable Sunsets

BECAUSE of the volcanic hypothesis that has been proposed to account for the red sunsets of the past fall and winter, other instances where similar phenomena have been seen after like eruptions are of interest.

Graham's Island, which arose off Sicily in 1831, attracted attention from July 19 to August 16, but was most active on August 7, according to the account given by John Davy in the *Philosophical Transactions* for 1832. The same writer says (p. 252):—“In the month of August a singular appearance was witnessed in the heavens, many evenings successively, both here and in Sicily. Soon after sunset the western sky became of a dark, lurid red, which extended almost to the zenith, and continued gradually diminishing in extent and intensity even beyond the limit of twilight.”

A few days after this eruption, August 11 and 12, on the clearing away of a hurricane, the sun appeared blue at the Bermuda Islands (*Amer. Journ. Sci.* xl. p. 323); on August 13, 14, 15, at Mobile, in the southern part of the United States, the rays of the sun were pale blue or violet, varying to sea green (*Amer. Journ. Sci.* xxi. p. 198).

In the month of October the sunsets were prominent enough in the vicinity of Washington to attract popular inquiry. At Alexandria, Virginia, October 12, the heavens continued to reflect a very red light for a long time after the sun had set. October 13, at midday, the sun had a silvery appearance, and its rays gave a ghastly appearance to the countenances of persons. Between 3 and 4 p.m. it appeared greenish blue (*Niles' Register*, October 1831).

L. G. CARPENTER
State Agricultural College, Lansing, Michigan, U.S.A.,
April 17

It may interest readers of NATURE to learn that on the occasion of a rain-storm at 5 p.m. on the 26th ult. at Crowle, an agricultural village a few miles eastward of this city, the rain-water was so greatly discoloured and loaded with an ash-like matter as to present, until after subsidence, a deep black hue, when caught in vessels placed for the purpose. Again, on Saturday last, the 3rd inst., on the occurrence in this city of rain-storms during a half gale from the north-west, there remained after the storms, on the panes of windows exposed to the north-west, a considerable film of dust which had fallen with the rain. While writing it may be mentioned that the phenomenon described as red sunrises and sunsets has prevailed here, before and after sunset, ever since November 9 last; of late, in gradually decreasing tone and variety of colour, and extent of sky area. The coloration at this date is of a russet hue, and there is a steely glare.

J. LL. BOZWARD
Worcester, May 5

Rotating Thermometers

IN reference to the Froude thermometer, to which attention is drawn in your last number (p. 6) by Mr. Hazen, I feel confident that if its merits were better known it would be universally employed, not only as insuring among all observers absolute uniformity in the record of the temperature of the air, but as affording the only satisfactory means of determining the degree of saturation by means of the wet and dry bulb. Nothing is more perplexing to the meteorologist than the selection of his screen and of an appropriate site. The system of whirling a thermometer rapidly through the air effectually dwarfs all external influences from the rapidity with which renewed particles constantly impinge on the bulb, and it is well known that in the case of the wet bulb the indication is greatly affected by the presence or absence of wind. I found this to be practically the only means of determining the temperature and humidity in a steamer at sea. The only objection was the inconvenience and risk of whirling small thermometers on a string,